

# REPORT DOCUMENTATION PAGE

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1996 GORDON RESEARCH CONFERENCE

ON ENERGETIC MATERIALS

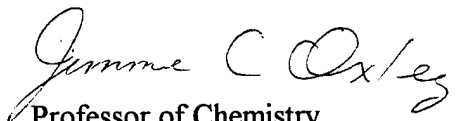
FINAL PROGRESS REPORT

GRANT NO: AFOSR F49620-96-1-0146

The Gordon Research Conference on Energetic Materials was held in New Hampton, NH at New Hampton School from 16 June to 21 June 1996. The Conference was well-attended with 117 in this field coming from academia, industry, and government laboratories, both U.S. and foreign scientists, senior researchers, young investigators, and students.

In designing the formal speakers program, emphasis was placed on current unpublished research and discussion of the future target areas in this field. There was a conscious effort to stimulate lively discussion about the key issues in the field today. Time for formal presentations was limited in the interest of group discussions. In order that more scientists could communicate their most recent results, poster presentation time was scheduled. Attached is a copy of the formal schedule and speaker program and the poster program. In addition to these formal interactions, "free time" was scheduled to allow informal discussions. Such discussions are fostering new collaborations and joint efforts in the field.

I want to personally thank you for your support of this Conference. As you know, in the interest of promoting the presentation of unpublished and frontier-breaking research, Gordon Research Conferences does not permit publication of meeting proceedings. If you wish any further details, please feel free to contact me. Thank you.

  
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5th GORDON RESEARCH CONFERENCE  
**ENERGETIC MATERIALS**

June 16-21, 1996  
 New Hampton School, NH



Chair: Jimmie C. Oxley (URI)  
 Vice-Chairs: Steve Coffey (NSWC)  
 Anatoly Dremmin (InstChemical Physics)

Financial support from:

Gordon Research Conferences  
 Sandia & Lawrence Livermore National Labs  
 Office of Naval Research  
 Air Force Office of Scientific Research  
 Army Research Office  
 TPL (reception)

**POSTERS 5th GRC on ENERGETIC MATERIALS**  
 IT Kraig Anderson (SNL, NM) "Thermal Decomposition of PETN"

2M James Barrett (NRL) "Effects of Crystalline Defects on the Initiation to Detonation Process in Model Energetic Materials"

3T Tod Botcher (City College, NY) & Tom Russell (NRL) "Pressure Dependence of the Decomposition of Condensed Phase RDX"

4T Haryuki Arisawa & Tom Brill (U Delaware) "Flash Pyrolysis Kinetics & Species of Azide Polymers: GAP"

5T Polly Gongwer & Tom Brill (U Delaware) "Flash Pyrolysis of Intimate Binder/Monopropellant Mixtures: RDX + CAB"

6T Ray Butcher; Rich Gilardi (NRL) "The Structure of Energetic Salts of Dinitramide with Main Group Transition Metal & Organic Cations"

7T Sury Bulusu (Picatinny, NJ); Rich Behrens (SNL, CA) "A Comparative Study of the Thermal Decomposition Mechanisms & Pathways of RDX, HMX, TNAZ, & Other Cyclic Nitramines"

8T Chris Capellos (Picatinny, NJ) "Ultrafast Decomposition in Energetic Nitramines" & "New Melt-Cast Formulations TNAZ"

9M C. Steve Coffey (NSWC) "Initiation by Impact or Mild Shock"

10M Arthur Cohen; R. A. Beyer "High Power Laser Ablation and Ignition of Solid Propellants"

11M Anatoly N. Dremmin (Russia) "To the Intrafront Stage Reality at Detonation of Ideal Condensed Explosives"

12T Paritosh Dave (GeoCenters, NJ) "Acylative Dealkylation of Azetidines: Application to Alternate Syntheses of TNAZ"

13M Richard Gilardi (NRL) "Crystal Structure & Density Nitro Cubanes"

14M W. Michael Howard & Laurence E. Fried (LLNL) "Kinetic Modeling of Non-Ideal Explosives with Cheetah"

15T Sampat R. Jain (India) "New Energetic Polymeric Binders"

16M Ed Kober (LANL) "Micromechanical Simulations of Plastic-Bonded High Explosives"

17T Sandor Kristyan & M.C. Lin (Emory, GA) "The Application of Energy Transfer & Tunneling to Reactions of Interest to Propellant Decomposition"

18M Joonbum Park & M.C. Lin (Emory, GA) "Mass-Spectrometric Studies of the NH<sub>2</sub>-NO<sub>x</sub> Chemistry for Mechanistic Elucidation of AN & AND Combustion Reactions"

19M Phil Pagoria (LLNL) "New Approaches to the Synthesis of

**Insensitive Energetic Materials"**

20M Julian J. Lee & M. Brouillette (USherbrooke, QC, Canada) "Detonation Mechanisms in a Heterogeneous Condensed-Phase Explosive"

21T Leanna Minier; Richard Behrens (SNL, CA); Ted Burke (U Memphis) "A Solid-Phase Thermal Decomposition Study of NTO Using Simultaneous Thermogravimetric Modulated Beam Mass Spectrometry (STMBS)"

22M Indu Mishra (Howard U, Wash DC) & Tom Russel (NRL) Thermal Stabilization of AND"

23M Albert Nichols (LLNL) "Coupled Thermal Mechanical Chemical Modeling of Energetic Materials"

24T Weiyei Zheng; Jimmie Oxley; James Smith; Evan Rogers; Michael Coburn (U Rhode Island) "Thermal Decomposition Studies on TNAZ"

25T Xiaoxia Dong; Jimmie Oxley; James Smith; (U Rhode Island) "Kinetics and Mechanisms for Thermal Decomposition of NTO"

26M Tatyana S. Pivina; A.A. Porollo; E.V. Sokerina; V.A. Tartakovsky (Zelinsky Inst.; Russia) "Computer Modeling of Probable Decomposition Reactions for Energetic Compounds"

27M Alexandra Pilgrim (DRA, UK) "Novel Method for Chemiluminescence Detection of Explosives Traces"

28T Michael Schroeder (ARL) "Condensed-Phase Processes in Combustion of Solid Gun Propellants"

29M Ph. Simonetti (CEA, France) "Study of Explosive Initiation at a Molecular Level: Shock Wave & Electronic Structure"

30T D.C. Sorescu; B.M. Rice; C. F. Chabalowski (ARL, MD); D. Thompson (Oklahoma, SU) "Intermolecular Potential for Cyclotrimethylene-trinitramine (RDX)"

31M Nirupam Trivedi (NSWC, MD) "Transannular Reactions in Syntheses of Difluoramine Based Energetic Materials"

32M Fred Volk (Fraunhofer Inst., Germany) "Detonation Products of Al-Containing High Explosives"

33T Shmuel Welner (ADA, Israel); Yehuda Hass; Y. Ben-Eliahu (Hebrew U, Jerusalem, Israel) "Initiation of GAP Decomposition by Pulsed IR & UV Laser"

34M D. Picat & R. Belmas (CEA FRANCE) "Pressed Explosives Mechanical Behavior, Damage, & Effects on Sensitivity--Experiments & Modeling"

35T K. L. McNesby (ARL) "Spectroscopic Determination of Impact Sensitivities of Explosives"

## Sunday Evening, June 16

### Data Collection in Fast Reactions

Discussant: Rich Behrens (Sandia, CA)

7:30-7:50 Jane Rice (NRL) High-Pressure Matrix Isolation of Heterogeneous Reactions

8:00-8:20 Tom Russell (NRL) Time-Resolved

Optical Spectroscopy of Energetic Material

Decomposition under Static High Pressure

8:30-9:10 Vitaly Pepekina (Semenov

Inst. Chem. Physics) & Boris Kondrikov (Mendeleev

U ChemTech) Thermochemistry, Burning, & Detonation

of Energetics Containing Nitrogen Acid Derivatives

## Monday Morning, June 17

### Energetic Material Synthesis

Discussant: Jeff Botaro (SRI)

9:00-9:40 Mike Hiskey (LANL) Explosive

Synthesis at Los Alamos National Laboratory

10:00 Coffee & Photo

10:30-11:10 Bob Chapman (NAWC) Energetic Potpourri

11:30-12:10 Surya Prakash (USC) Studies on

Potential Energetic Nitro Functional Groups &

Compounds

## Monday 4:30-6:00; June 17

### Poster Session "M" & Reception

## Monday Evening, June 17

### Energetic Material Synthesis

Discussant: Phil Pagoria (LLNL)

7:30-8:00 Ross Millar (DRA) Newer Nitration

Methods for Synthesis of Energetic Compounds

8:15-8:35 Mike Coburn (LANL) Synthesis &

NMR of  $^2\text{H}$ ,  $^{13}\text{C}$ , and  $^{15}\text{N}$  Labeled Derivatives of TNAZ

8:45-9:25 Alan Marchand (UNT) & Bob

McKenney Synthesis of 1,3,3-Trinitroazetidine (TNAZ)

& Related Compounds

## Tuesday Morning, June 18

### Initiation and Detonation Models

Discussant: Carl Melius (Sandia, CA)

9:00-9:40 John Gilman (UCLA) Mechanochemistry

at Detonation Fronts in Solids

10:00 Coffee

10:15-10:55 Joe Shepard (CalTech) What Kind of

Chemistry Do You Have in Your Detonation?

11:15-11:55 Barry Kunz (Michigan Tech) Excited

Electronic States in Initiation of Solid Detonations

12:10-12:30 Malcolm Nicol (UCLA) Some

Thoughts on Initiation and Detonation Models

## Tuesday 4:30-6:00, Poster Session "T"

## Tuesday Evening, June 18

### Energetic Polymers

Discussant: Tom Archibald (Aerojet)

7:30-8:00 Lou Cannizzo (Thiokol) Effects of

Chemical Structure on Physical Properties in Oxetane

Polymers

8:15-8:45 Gerry Manser (Aerojet) Development of

Energetic Oxetane Polymers

9:00-9:30 Don Thompson (Oklahoma S)

Theoretical Chemical Dynamics Studies of Energetic

Materials

## Wednesday Morning, June 19

### Non-Ideal Explosives

Discussant: Kevin McNesby (ARL)

9:00 John Lee (McGill) On Modeling of the Rate

Law for Non-Ideal Explosives

10:00 Coffee

10:30 Scott Stewart (U of Illinois) Ignition

Mechanisms of Energetic Materials

11:30-12:10 Jerry Forbes (NSWC) Detonation

Properties of Non-ideal Explosives

## Wednesday Evening, June 19

### Experimental Examination of

### Detonation & Combustion

Discussant: Randy Simpson (LLNL)

7:30-8:10 Blaine Asay (LANL) Dynamic

Measurement of Strain in Deforming of Explosives

8:30-9:10 Ming-Chang Lin (Emory) Experimental

& Theoretical Studies of Elementary Processes in

Nitramine Combustion

9:30-10:00 Joe Foster (Eglin) Mechanical Ignition

of Combustion in Explosives

## Thursday Morning, June 20

### Propellant Combustion

Discussant: Tom Brill (U Delaware)

9:00-9:40 Tom Litzinger (Penn State) Mass

Spectroscopic Studies of Propellant Flames

10:00 Coffee

10:30-11:10 Vigor Yang (Penn State) Interaction

between Unsteady Flow & Combustion of Energetic

Materials

11:30-12:10 Merrill Beckstead (BYU) Solid

MonoPropellant Combustion

## Thursday Evening, June 20

### Applied Explosives Chemistry

Discussant: Mike McBride (Yale)

7:30-8:10 Steve Burneister (FBI)

The Forensics of Explosives

8:30-9:10 Gerald Laib (NSWC)

The Chemistry of Fireworks

# Conference Registration List

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